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266. Proposed by DR. O. E. GLENN, Drury College.

Given the feet of the three perpendiculars from any point a on the circumcircle to the sides of the triangle are collinear, then if on the three chords $\overline{ab}$, $\overline{ac}$, $\overline{ad}$, as diameters circles be described, the points of intersection of these circles are collinear. [Salmon's *Higher Plane Curves*].

I. Solution by M. E. GRABER, A. M., Heidelberg University, Tiffin, Ohio.

Let A, B, and C be the points of intersection of the circumferences described on ab, ac, and ad as diameters. Then since the diameters are concurrent at a, and A is common to two circles which have a common chord, $\angle cAa$ and $\angle dAa$ are right angles, and therefore their two non-coincident sides form a straight line through c and d. Likewise B is collinear with b and d, and consequently with c and d. Also C is collinear with b and c since there cannot be more than one perpendicular to the common chord at C. Therefore A, B, and C are collinear.

II. Solution by the PROPOSER.

By inversion with respect to a as a center, ab, ac, ad remain invariant. The given circle inverts into its radical axis with the circle of inversion, and the three circles in question into a triangle in the circle of inversion. The vertices of this triangle lie on a circle passing through a, for perpendiculars from a on the sides are collinear. Hence the invert of a circle through the intersections of the circles in question is a circle through a, and hence the circle through these intersections is a straight line.

Also solved by G. B. M. Zerr.

GROUP THEORY.

10. Proposed by O. E. GLENN, Ph. D.

Find the order of the group of isomorphisms (H) of the group (G) of order p^4 defined by the relations $P_1^{p^2}=P_2^{p^2}=I$, $P_1P_2=P_2P_1$.

Solution by the PROPOSER.

In the general isomorphism represented by

$$*J=\begin{pmatrix} P_1, \; P_2 \\ P_1^xP_2^y, \; P_1^zP_2^w \end{pmatrix}$$

the operation $P_1^\alpha P_2^\beta$ corresponds to $P_1^{x'}P_2^{y'}$, where

$$\begin{matrix} x'\equiv \alpha x+\beta z \\ y'\equiv \alpha y+\beta w \end{matrix} \pmod{p^2} \text{.........(I).}$$

Hence H is isomorphic with the congruence group defined by (I) and its order h equals the number of sets of values x, y, z, w for which

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*Burnside, *Finite Groups*, p. 222.